Abington Heights School District
Grade 8 Pre-Algebra Mathematics Curriculum

In Eighth Grade Pre-Algebra, students develop their numeracy skills through the following areas of study:

1. The Number System
2. Expressions and Equations
3. Functions
4. Geometry
5. Statistics and Probability

Board Approval Date: 5/3/2023
Adoption: 2023 - 2024 SY
Review Date:

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

AH MATHEMATICS

Where collaborative problem solving and perseverance lead to excellence

Abington Heights Math Framework

Stakeholders	Actions
Students	★ Engage in mathematical discussions, share their ideas openly, be inquisitive, seek to understand and learn more about mathematical concepts, and try their best daily. ★ Exhibit creativity and curiosity in problem solving individually and collaboratively. ★ Persevere in engaging and challenging daily mathematical practice. ★ Come prepared to learn every day.
Teachers	★ Create a safe and collaborative classroom environment where students feel vested in a shared vision for mathematical excellence. ★ Develop high quality instruction that meets the needs of all learners through differentiation. ★ Use a variety of 21st century methodologies to advance learning. ★ Partner with parents and guardians to support student success. ★ Establish a collaborative community within the building and amongst grade levels to ensure a cohesive level of instruction.
Building Leaders	★ Deeply understand the needs of teachers, students, the instructional materials being used, programs being implemented, and the expectations for state-level assessment scores ○ Knowledgeable about program and grade level standards ○ Ensure consistent and equal access to high-quality instructional materials and resources, building. ★ Be partners with teachers, students and families: ○ Provide guidance and support to the mathematical community. ○ Understand needs of teachers, students and families. ★ Trust the educators to make professional decisions based on program, student, and district needs.
Central Admin	★ Effectively communicate to the school board and community specific areas of need and how to support teachers and building leaders in a quest for mathematical excellence ★ Deeply understand the needs of teachers, students, the instructional materials being used, programs being implemented, and the expectations for state-level assessment scores ○ Have a common metric for mathematical excellence. ○ Ensure consistent and equal access to high-quality instructional materials and resources, district. ○ Re-examine best practices/curriculum routinely (6 years). ★ Support a culture of collaboration between the other stakeholder groups to maintain the standard of excellence of the Abington Heights ★ Trust the educators to make professional decisions based on program, student, and district needs.
Parents/ Community	★ Be a strong support system and contribute by building a positive math community for students. ★ Encourage a positive math mindset. ★ Have conversations with their children about school and ask what they are learning about in school. ★ Be open, receptive to the district's ideas about student learning and reach out to teachers/school to learn more about how they can support. ★ Trust the educators to make professional decisions based on program, student, and district needs.
School Board	★ Provide the fiscal resources to support: ○ Highly qualified professionals for mathematics ○ High-quality instructional materials ○ Effective and efficient math interventions for remediation ○ Professional development for math content and instructional practices ★ Trust the educators to make professional decisions based on program, student, and district needs.

Abington Heights Grade 8 Pre-Algebra Mathematics Curriculum

PA Core Standards	PA Eligible Content	Big Ideas Mathematics Grade 8 Lessons
The Number System		
CC.2.1.8.E.1 Distinguish between rational and irrational numbers using their properties.	M08.A-N.1.1.1 Determine whether a number is rational or irrational. For rational numbers, show that the decimal expansion terminates or repeats (limit repeating decimals to thousandths). M08.A-N.1.1.2 Convert a terminating or repeating decimal to a rational number (limit repeating decimals to thousandths). A1.1.1.1.1 Compare and/or order any real numbers. Note: Rational and irrational may be mixed. A1.1.1.1.2 Simplify square roots (e.g., $\sqrt{24} = 2\sqrt{6}$).	7.4, Extension 7.4
CC.2.1.8.E.4 Estimate irrational numbers by comparing them to rational numbers.	M08.A-N.1.1.3 Estimate the value of irrational numbers without a calculator (limit whole number radicand to less than 144). Example: $\sqrt{5}$ is between 2 and 3 but closer to 2. M08.A-N.1.1.4 Use rational approximations of irrational numbers to compare and order irrational numbers. M08.A-N.1.1.5 Locate/identify rational and irrational numbers at their approximate locations on a number line. A1.1.1.1.1 Compare and/or order any real numbers. Note: Rational and irrational may be mixed.	7.4
Expressions and Equations		
CC.2.2.8.B.1 Apply concepts of radicals and integer	M08.B-E.1.1.1 Apply one or more properties of integer exponents to generate equivalent numerical expressions without	7.1, 7.2, 7.3, 7.4, 7.5, 10.1, 10.2, 10.3, 10.4,

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exponents to generate equivalent expressions.	a calculator (with final answers expressed in exponential form with positive exponents). Properties will be provided. Example: 312 × 3 _15 = 3 _3 = 1/(33) M08.B-E.1.1.2 Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Evaluate square roots of perfect squares (up to and including 122) and cube roots of perfect cubes (up to and including 53) without a calculator. Example: If x2 = 25 then x = ±√25. M08.B-E.1.1.3 Estimate very large or very small quantities by using numbers expressed in the form of a single digit times an integer power of 10 and express how many times larger or smaller one number is than another. Example: Estimate the population of the United States as 3 × 108 and the population of the world as 7 × 109 and determine that the world population is more than 20 times larger than the United States' population. M08.B-E.1.1.4 Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Express answers in scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology (e.g., interpret 4.7EE9 displayed on a calculator as 4.7 × 109). A1.1.1.3.1 Simplify/evaluate expressions involving properties/laws of exponents, roots, and/or absolute values to solve problems. Note: Exponents should be integers from –10 to 10.	10.5, 10.6, 10.7
CC.2.2.8.B.2	M08.B-E.2.1.1 Graph proportional relationships, interpreting	4.1, 4.2, Extension 4.2,

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Understand the connections between proportional relationships, lines, and linear equations.	the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. Example: Compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. M08.B-E.2.1.2 Use similar right triangles to show and explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane. M08.B-E.2.1.3 Derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b. A1.2.1.2.2 Translate from one representation of a linear function to another (i.e., graph, table, and equation).	4.3, 4.4, 4.5
CC.2.2.8.B.3 Analyze and solve linear equations and pairs of simultaneous linear equations.	M08.B-E.3.1.1 Write and identify linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers). M08.B-E.3.1.2 Solve linear equations that have rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. M08.B-E.3.1.3 Interpret solutions to a system of two linear equations in two variables as points of intersection of their graphs because points of intersection satisfy both equations simultaneously.	1.1, 1.2, 1.3, 1.4, 5.1, 5.2, 5.3, 5.4, Extension 5.4

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	M08.B-E.3.1.4 Solve systems of two linear equations in two variables algebraically and estimate solutions by graphing the equations. Solve simple cases by inspection. Example: 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6. M08.B-E.3.1.5 Solve real-world and mathematical problems leading to two linear equations in two variables. Example: Given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair. A1.1.2.1.1 Write, solve, and/or apply a linear equation (including problem situations). A1.1.2.2.1 Write and/or solve a system of linear equations (including problem situations) using graphing, substitution, and/or elimination. Note: Limit systems to two linear equations. A1.1.2.2.2 Interpret solutions to problems in the context of the problem situation. Note: Limit systems to two linear equations.	
Functions		
CC.2.1.8.C.1 Define, evaluate, and compare functions.	M08.B-F.1.1.1 Determine whether a relation is a function. M08.B-F.1.1.2 Compare properties of two functions, each represented in a different way (i.e., algebraically, graphically, numerically in tables, or by verbal descriptions). Example: Given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change. M08.B-F.1.1.3 Interpret the equation y = mx + b as defining a linear function whose graph is a straight line; give examples of	6.1, 6.2, 6.3, 6.4

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	functions that are not linear. A1.1.2.1.1 Write, solve, and/or apply a linear equation (including problem situations). A1.2.1.1.2 Determine whether a relation is a function, given a set of points or a graph. A1.2.1.2.1 Create, interpret, and/or use the equation, graph, or table of a linear function. A1.2.1.2.2 Translate from one representation of a linear function to another (i.e., graph, table, and equation).	
CC.2.1.8.C.2 Use concepts of functions to model relationships between quantities.	M08.B-F.2.1.1 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models and in terms of its graph or a table of values. M08.B-F.2.1.2 Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch or determine a graph that exhibits the qualitative features of a function that has been described verbally. A1.1.2.1.3 Interpret solutions to problems in the context of the problem situation. Note: Linear equations only. A1.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically.	4.6, 4.7, 6.3, 6.5

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	A1.2.1.2.2 Translate from one representation of a linear function to another (i.e., graph, table, and equation). A1.2.2.1.3 Write or identify a linear equation when given: the graph of the line, two points on the line, or the slope and a point on the line. Note: Linear equation may be in point-slope, standard, and/or slope-intercept form. A1.2.2.1.4 Determine the slope and/or y-intercept represented by a linear equation or graph.	
Geometry		
CC.2.3.8.A.1 Understand and apply congruence and similarity using various tools.	M08.C-G.3.1.1 Apply formulas for the volumes of cones, cylinders, and spheres to solve real-world and mathematical problems. Formulas will be provided.	2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 3.1, 3.2, 3.3, 3.4
CC.2.3.8.A.2 Understand and apply the Pythagorean Theorem to solve problems.	M08.C-G.1.1.1 Identify and apply properties of rotations, reflections, and translations. Example: Angle measures are preserved in rotations, reflections, and translations. M08.C-G.1.1.2 Given two congruent figures, describe a sequence of transformations that exhibits the congruence between them. M08.C-G.1.1.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. M08.C-G.1.1.4 Given two similar two-dimensional figures, describe a sequence of transformations that exhibits the similarity between them.	7.3/KA, 7.5/KA
CC.2.3.8.A.3 Apply the concepts of volume of	M08.C-G.2.1.1 Apply the converse of the Pythagorean theorem to show a triangle is a right triangle.	8.1/KA, 8.2/KA, 8.3/KA, 8.4/KA

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cylinders, cones, and spheres to solve real-world and mathematical problems.	M08.C-G.2.1.2 Apply the Pythagorean theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. M08.C-G.2.1.3 Apply the Pythagorean theorem to find the distance between two points in a coordinate system.	
Statistics and Probability		
CC.2.4.8.B.1 Analyze and/or interpret bivariate data displayed in multiple representations.	M08.D-S.1.1.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative correlation, linear association, and nonlinear association. M08.D-S.1.1.2 For scatter plots that suggest a linear association, identify a line of best fit by judging the closeness of the data points to the line. M08.D-S.1.1.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. Example: In a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height. A1.2.2.2.1 Draw, identify, find, and/or write an equation for a line of best fit for a scatter plot.	9.1/KA, 9.2/KA, 9.4/KA
CC.2.4.8.B.2 Understand that patterns of association can be seen in bivariate data utilizing frequencies.	M08.D-S.1.2.1 Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible associations between the two	9.3/KA

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	variables. Example: Given data on whether students have a curfew on school nights and whether they have assigned chores at home, is there evidence that those who have a curfew also tend to have chores?	

Portrait of an Abington Heights 8th Grade Pre-Algebra Mathematician

By the end of 8th Grade Pre-Algebra, students will:

The Number System	Functions	Expressions and Equations	Geometry	Statistics and Probability
☐ Understand there are numbers that are not rational, and approximate them by using rational numbers ☐ Convert a terminating or repeating decimal to a rational number ☐ Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions	☐ Define, evaluate, and compare functions ☐ Compare tables, graphs, and equations ☐ Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear ☐ Use functions to model relationships between quantities ☐ Identify the rate of change and initial value of a linear function in the situation it models, and in terms of its graph or table of values	☐ Work with radicals and integer exponents ☐ Perform operations with scientific notation ☐ Perform operations with integer exponents ☐ Understand the connection between proportional relationships, lines, and linear equations ☐ Graph proportional relationships, interpreting the unit rate as the slope of the graph ☐ Analyze and solve linear equations and pairs of simultaneous linear equations ☐ Solve linear equations including rational coefficients ☐ Solve systems of linear equations	☐ Understand congruence and similarity using physical models or geometric software ☐ Identify transformations performed on a given object (reflections, rotations, translations, dilations) ☐ Understand that two figures are congruent if one can be obtained from another given a sequence of transformations (excluding dilations) ☐ Describe the effect of transformations on the coordinate plane ☐ Understand and apply the Pythagorean Theorem ☐ Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres	☐ Investigate patterns of association in bivariate data ☐ Construct and interpret scatter plots ☐ Use linear models to represent data and to solve problems ☐ Analyze frequency and relative frequency, and create two-way tables to represent distribution

Notes: